SINGLE MODE, SINGLE LOBE SURFACE EMITTING DISTRIBUTED FEEDBACK SEMICONDUCTOR LASER

ABSTRACT OF THE DISCLOSURE

A surface emitting semiconductor laser capable of operating at high power levels and with high efficiency is formed to emit in a single far-field lobe in a single mode. The laser includes a semiconductor substrate and epitaxial structure including an active region layer and cladding layers. A distributed feedback grating is formed of periodically alternating grating elements to provide optical feedback as a second order grating for the effective wavelength of light generation from the active region. Surface emission in a single lobe pattern may be obtained by forming one edge face of the structure to be reflective and the other face to be antireflective. The semiconductor laser may also be formed to have a symmetric near-field pattern and single lobe surface emission utilizing a phase shift in the 2^{nd}-order distributed feedback grating at its center and with antireflective edge faces. Passive distributed Bragg reflection gratings may be formed adjacent the distributed feedback grating to provide guided-field uniformity while maintaining high efficiency. Such laser structures provide single lobe far-field surface emission without requiring the use of lossy elements in the distributed feedback grating, thus allowing high efficiency and high power to be achieved.